Project Title:
A Statistical Model of High-Latitude Convection Referenced to Auroral Boundaries

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Project Information:
The interaction of the magnetized plasma of the solar wind with the Earth's magnetic field is an important source of Sun-Earth coupling. The transfer of energy and momentum to the magnetosphere and ionosphere gives rise to disturbances in geospace that disrupt technological systems. To understand these processes, accurate models of the global distribution of electric field are needed. We propose to develop a statistical convection model that will utilize information on auroral boundaries to greatly improve on the accuracy that is currently available. The convection velocity measurements will be provided by the HF radars of the Super Dual Auroral Radar Network (SuperDARN). The Ultraviolet Imager (UVI) instrument of the Polar satellite will provide global snapshots of auroral luminosity, from which information on auroral boundaries can be derived. The IMF conditions imposed on the magnetosphere will be determined from measurements made at upstream satellites (ACE, Wind, IMP8). The velocity data are to be sorted by IMF conditions and processed in a coordinate system defined by the poleward edge of the UVI luminosity. The mapping to this coordinate system essentially orders the velocity data according to the auroral geometry. The model will greatly improve on the mapping of structure in the convection patterns by reducing the smearing of features that results from auroral variability. The new patterns will show the spatial relationships between the distributions of electric fields and precipitating particles and lead to an improved understanding of coupling processes. We will map the model patterns into the magnetosphere. The convection model and related products will be distributed freely via the JHU/APL SuperDARN web site.

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Citations: